

CHAPTER I

INTRODUCTION

1. Background and Justifications

More than 80% of the goat population in Thailand are in the southern region. They are primarily raised for meat by small holders as a secondary enterprise to crop production. Thai native goats are similar to the Katjang breed of Malaysia. The major colors of goats were brown, (49-60%) followed by cream, black and the combination of brown, black and white (Saithanoo and Milton, 1988). Estimates on the average body weights of adult indigenous goats also varied. Suthiwanich (1983) reported that female goats (1-3 years old) averaged 21-25 kg and males, 26-29 kg. Thai native goats are not seasonal breeders and exhibit estrus with ovulation in all months of the year. Indigenous does first come into estrus as early as 5-6 months of age. Does can be used for breeding when they reach 8-10 months of age or 20-25 kg in body weight. The estrous cycle in general ranges from 18-22 days (Pralomkarn et al., 1996). Although the goat is potentially a highly prolific animal which has a relatively short gestation period compared to other livestock species, little is known about their reproductive management due to a lack of information on the reproductive management i.e., feeding management, method of mating, time of first mating, pre- and postpartum management. In addition, the lack of knowledge in management application and assortments of reproductive technology for Thai-native goat production is another major concern. These limitations therefore will mostly affect the efficiency and capacity of goat production.

In the last 10-20 years, new biotechnologies have been developed that are on the verge of revolutionizing reproductive processes in humans and animals. In agriculture, modern techniques in assisted reproductive technology (ART) are being used for the introduction, improvement, and preservation of livestock genetics and the enhancement of animal reproductive efficiency. The ART techniques include artificial insemination, estrus synchronization, estrus induction, synchronization of parturition, superovulation, in vitro fertilization, in vivo and in vitro embryo production, embryo collection, embryo transfer, embryo cryopreservation, embryo

splitting, cloning, production of transgenic animals, and preimplantation genetic diagnosis (Baldassarre and Karatzas., 2004).

Recently, researcher have developed a nutrition regimen called a “stair-step feeding regimen” that is a combination of alternating dietary energy restrictions and realimentation phases (Park, 2005). The basic concept of this model is to exploit the biological nature of both dietary energy restriction and the compensatory growth phenomenon in concert with one or more hormone dependent allometric phases of body composition development (i.e., prepuberty, puberty, and late gestation). Energy restriction (i.e., providing all known essential nutrients but reducing caloric intake) has a profound influence on the biology and health of animals including the retardation of aging and the reduction of cancer incidence and other late-life diseases (Hursting et al., 2003). Through modulation of endocrine and enzymatic status, energy restriction shifts the physiological focus to energy-conserving activities, mainly maintenance and repair functions, and decreases certain energy-wasteful metabolic pathways (e.g., substrate cycles) that are not essential for growth (Newsholme, 1980). Realimentation (refeeding) after energy restriction induces compensatory growth, which is characterized by an accelerated anabolism, a reduced maintenance requirement, an activated endocrine status, and an altered tissue composition (Wilson, and Osbourn, 1960; Ashworth, and Millward, 1986). Compensatory growth enhances the efficiency of general body development and induces hyperplasia and hypertrophy of tissues and organs, including the mammary gland (Park, 2002). Hence, when using the stair-step compensatory nutrition model, mammary development is minimized during the energy restriction phase and maximized during the realimentation or compensatory growth phase (Park, 2005).

Therefore, the research study was focused on investigate the principle application of assisted reproductive technology (ART) such as induction of multiple follicular development and ovulation and compensatory growth application (using stair-step feeding regimen) in goats expecting that these appropriate technologies and management regimens could be used to enhance the efficiency of goat production.

2. Scientific Hypothesis

2.1 Growth pattern, feed intake, body weight, and age at the first estrus during post-weaning and pubertal period might be affected on fertility of Thai-native goat.

2.2 Principle application of assisted reproductive technology (ART) such as the inducement of multiple follicular development and ovulation with gonadotropins could be an effective protocols for reproductive management in Thai-native goat production.

2.3 Compensatory growth application (using stair-step feeding regimen) would be benefit in goat as a reproductive management regimen.

3. Objectives

3.1 To determine the growth pattern, body weight, and age at the first estrus during post-weaning and pubertal period in Thai-native goats.

3.2 To determine the follicular development and superovulation protocols for Thai-native goat.

3.3 To investigate the effect of a stair-step feeding regimen during the estrous cycle on follicular development oocytes quality and gene expression in Thai-native goats.

4. Scope of Study and Limitations

4.1 To characterize the growth pattern, feed intake and estrous cycle during post-weaning and pubertal period of Thai-native goat, and to use as principle data for ART and stair- step feeding in order to induce compensatory growth and enhance health and fertility.

4.2 To investigate management and principle application of ART such as induce multiple follicular development and ovulation with FSH and hCG (FSH decreasing dose, 2 or 3 days protocols) which could be effective protocol during pregestation periods in Thai-native goat production.

4.3 To investigate the applications of compensatory growth using a stair-step feeding regimen during the estrous cycle on follicular development and oocytes quality in Thai-native goats.

5. Expected Outcomes

Knowledge and information of assisted reproductive technology (ART) and compensatory growth application (using stair-step feeding regimen) on reproductive management can be applied such an effective protocol in goats for reproductive management in Thai-native goat. These technologies and reproductive management may lead to an improvement of fertility in goats of Thailand under small holder conditions

6. The Conceptual Frameworks

This thesis presents the work from three experiments: 1) Study on growth pattern during post-weaning and pubertal periods in Thai-native goats 2) Induction of multiple follicular development and ovulation in Thai-native goat using FSH and hCG and 3) Effect of stair-step feeding regimen during estrous cycle on fertility of Thai-native goats. A conceptual framework of this thesis is summarized in Figure 1.1.

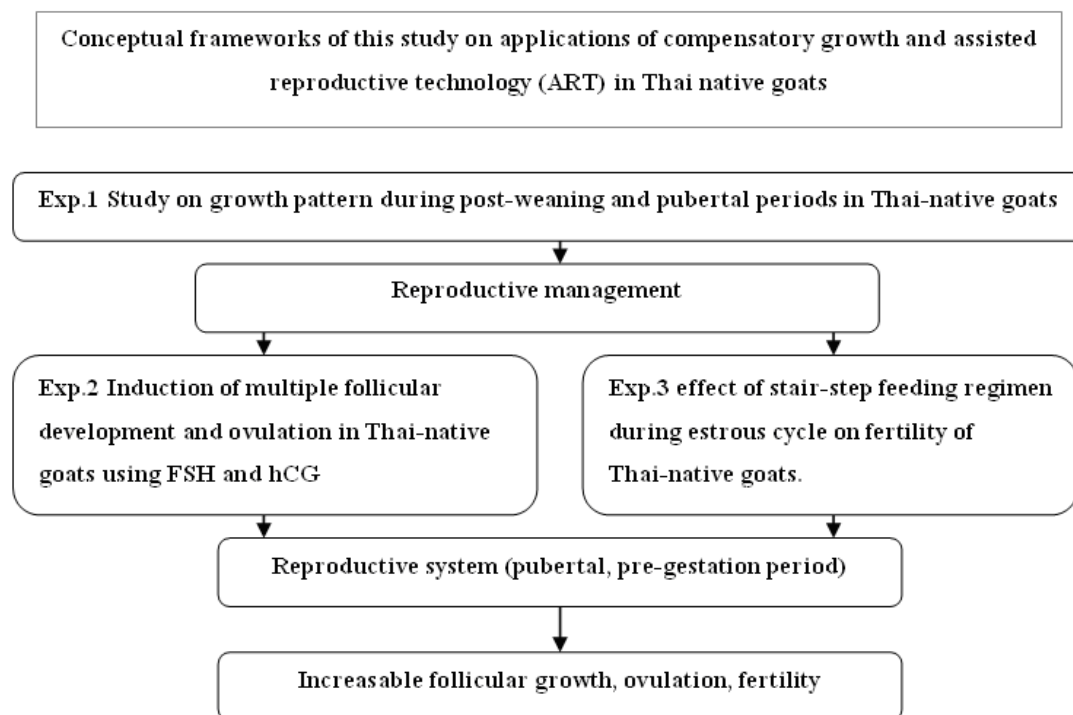


Figure 1.1 A conceptual framework of this thesis